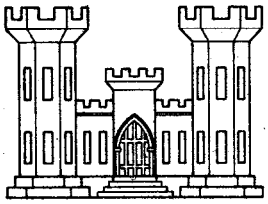
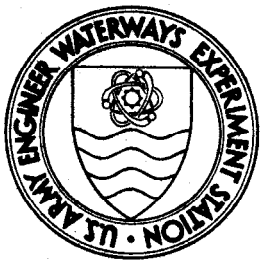


DREDGED MATERIAL RESEARCH PROGRAM



TECHNICAL REPORT D-77-42

AQUATIC DISPOSAL FIELD INVESTIGATIONS ASHTABULA RIVER DISPOSAL SITE, OHIO

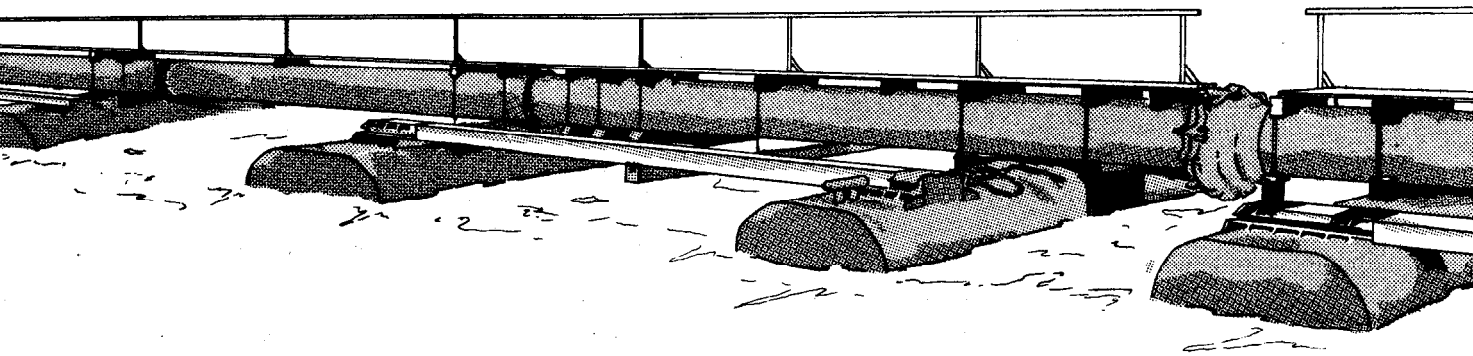
APPENDIX B: INVESTIGATION OF THE HYDRAULIC REGIME AND PHYSICAL NATURE OF BOTTOM SEDIMENTATION

by

L. J. Danek, G. R. Alther, P. P. Paily, R. G. Johnson
F. de Libero, J. F. Yohn, F. T. Lovorn

Nalco Environmental Sciences
1500 Frontage Road
Northbrook, Illinois 60062

December 1977
Final Report



Prepared for Office, Chief of Engineers, U. S. Army
Washington, D. C. 20314

Under Contract No. DACW39-75-C-0108
(DMRP Work Unit No. 1A08B)

Monitored by Environmental Effects Laboratory
U. S. Army Engineer Waterways Experiment Station
P. O. Box 631, Vicksburg, Miss. 39180

AQUATIC DISPOSAL FIELD INVESTIGATIONS, ASHTABULA RIVER DISPOSAL SITE, OHIO

Appendix A: Planktonic Communities, Fishery, and Benthic Assemblages

Appendix B: Investigation of the Hydraulic Regime and Physical Nature of Bottom Sedimentation

Appendix C: Investigation of Water-Quality and Sediment Parameters

DEPARTMENT OF THE ARMY
WATERWAYS EXPERIMENT STATION, CORPS OF ENGINEERS
P. O. BOX 631
VICKSBURG, MISSISSIPPI 39180

IN REPLY REFER TO: WESYV

31 December 1977

SUBJECT: Transmittal of Technical Report D-77-42 (Appendix B)

TO: All Report Recipients

1. The technical report transmitted herewith represents the results of one of several research efforts (work units) undertaken as part of Task 1A, Aquatic Disposal Field Investigations, of the Corps of Engineers' Dredged Material Research Program. Task 1A is a part of the Environmental Impacts and Criteria Development Project (EICDP), which has as a general objective determination of the magnitude and extent of effects of disposal sites on organisms and the quality of surrounding water, and the rate, diversity, and extent such sites are recolonized by benthic flora and fauna. The study reported herein was an integral part of a series of research contracts jointly developed to achieve the EICDP general objective at the Ashtabula, Ohio, site in Lake Erie, one of five sites located in several geographical regions of the United States. Consequently, this report presents results and interpretations of but one of several closely interrelated efforts and should be used only in conjunction with and consideration of other related reports for this site.

2. This report, Appendix B: Investigation of the Hydraulic Regime and Physical Nature of Bottom Sedimentation, is one of three contractor-prepared appendices published relative to Waterways Experiment Station Technical Report D-77-42 entitled Aquatic Disposal Field Investigations, Ashtabula River Disposal Site, Ohio. The titles of all contractor-prepared appendices of this series are listed on the inside front cover of this report. The main report will provide additional results, interpretations, and conclusions not found in the individual appendices and provide a comprehensive summary and synthesis overview of the entire project.

3. The purpose of this study, conducted as Work Unit 1A08B, was to identify the baseline hydraulic regime, the meteorology, and the physical nature of bottom sedimentation in the Ashtabula Disposal Site and the surrounding area. The report includes a discussion of the distribution of sediments and the distribution of currents that affect sediment erosion, transportation, and deposition within and in the vicinity of the site. The sediment distribution was determined through grab sampling,

subbottom profiling, and coring of the area. Circulation patterns were delineated with current meters and wave gages. Temperature profiles, suspended sediment sampling, and investigations of the interaction at the sediment-water interface were also made to obtain data needed to determine the movement of sediment within the site. Water levels of Lake Erie and flow rate and suspended sediment load of the Ashtabula River were determined.

4. A conclusion of this report, based on the data presented, was that the Ashtabula Disposal Site was an acceptable site for use as a dredged material repository where the dredged material disposal operation had little effect on the physical nature of the area. The localized increases in temperature, turbidity, and currents resulting from the descending material were transient and the conditions generally returned to normal within an hour.

5. The evaluations at all of the EICDP field sites were developed to determine the base or ambient physical, chemical, and biological conditions at the respective sites from which to determine impacts due to the subsequent disposal operations. Where the dump sites had historical usage, the long-term impacts of dumping at these sites could also be ascertained. The results of this study are important in determining placement of dredged material for open-water disposal. Referenced studies, as well as the ones summarized in this report, will aid in determining the optimum disposal conditions and site selection for either the dispersion of the material from the dump site or for its retention within the confines of the site, whichever is preferred for maximum environmental protection at a given site.

JOHN. L. CANNON
Colonel, Corps of Engineers
Commander and Director

Unclassified

SECURITY CLASSIFICATION OF THIS PAGE *(When Data Entered)*

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER Technical Report D-77-42	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER
4. TITLE *(and Subtitle)* AQUATIC DISPOSAL FIELD INVESTIGATIONS, ASHTABULA RIVER DISPOSAL SITE, OHIO, APPENDIX B: Investigation of the Hydraulic Regime and Physical Nature of Bottom Sedimentation		5. TYPE OF REPORT & PERIOD COVERED Final report 6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s) L. J. Danek, G. R. Alther, P. P. Paily, R. G. Johnson, F. de Libero, J. F. Yohn, F. T. Lovorn		8. CONTRACT OR GRANT NUMBER(s) Contract No. DACW39-75-C-0108
9. PERFORMING ORGANIZATION NAME AND ADDRESS Nalco Environmental Sciences 1500 Frontage Road Northbrook, Illinois 60062		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS DMRP Work Unit No. 1A08B
11. CONTROLLING OFFICE NAME AND ADDRESS Office, Chief of Engineers, U. S. Army Washington, D. C. 20314		12. REPORT DATE December 1977 13. NUMBER OF PAGES 597
14. MONITORING AGENCY NAME & ADDRESS *(if different from Controlling Office)* U. S. Army Engineer Waterways Experiment Station Environmental Effects Laboratory P. O. Box 631, Vicksburg, Mississippi 39180		15. SECURITY CLASS. *(of this report)* Unclassified 15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT *(of this Report)*

Approved for public release; distribution unlimited.

17. DISTRIBUTION STATEMENT *(of the abstract entered in Block 20, if different from Report)*

18. SUPPLEMENTARY NOTES

19. KEY WORDS *(Continue on reverse side if necessary and identify by block number)*

Ashtabula River	Dredged material disposal
Bottom sediment	Hydraulic regime
Disposal areas	Lake Erie
	Sedimentation

20. ABSTRACT *(Continue on reverse side if necessary and identify by block number)*

An investigation of the hydraulic regime and physical nature of bottom sedimentation was conducted in Lake Erie near the Ashtabula Disposal Site. The field sampling phase of the program, conducted between June 1975 and September 1976, included detailed monitoring of physical parameters before, during, and after disposal operations at the disposal sites and at reference stations. The various hydraulic, sedimentologic, and limnologic data gathered from the site and analyzed include bathymetry and (Continued)

DD FORM 1 JAN 73 1473 EDITION OF 1 NOV 65 IS OBSOLETE

Unclassified

SECURITY CLASSIFICATION OF THIS PAGE *(When Data Entered)*

20. ABSTRACT (Continued).

subbottom profiles; current speed and direction, temperature, and transmissivity within the water column; wave characteristics; bottom sediment characteristics and distribution; water levels of Lake Erie; and flow rate and suspended sediment load of the Ashtabula River.

The study indicated that the dredged material disposal operation had little effect on the physical nature of the area. The localized increases in temperature, turbidity, and currents resulting from the descending material were quite transient and the conditions generally returned to ambient within an hour. The resulting sediment piles on the lake bottom were less than 0.5 m thick, and were subject to erosion from currents and waves. The currents were the main cause of erosion as most of the wave energy did not penetrate to the bottom. Most of the sediment erosion and subsequent transport occurred during storms when current speeds and wave heights were greatest. Since the currents were generally parallel to shore, the transport of the resuspended dredged material was probably shore-parallel and the material could have traveled several kilometers before settling out of the water column. Analysis of bottom sediment cores revealed that the dredged material was difficult to distinguish from the original lake bottom, indicating that the disposal operation produced only minimal changes in the physical nature of the sediments in the area.

THE CONTENTS OF THIS REPORT ARE NOT TO BE USED FOR ADVERTISING, PUBLICATION, OR PROMOTIONAL PURPOSES. CITATION OF TRADE NAMES DOES NOT CONSTITUTE AN OFFICIAL ENDORSEMENT OR APPROVAL OF THE USE OF SUCH COMMERCIAL PRODUCTS.